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TITLE: Melt beneath the Siple Coast Ice Streams

OTHER AUTHORS: S. Tulaczyk

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KEY WORDS FOR INDEXING *(Separate terms with commas)*: glaciology

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Melt Beneath the Siple Coast Ice Streams

Ian Joughin
Jet Propulsion Laboratory
California Institute of Technology
M/S 300-235
4800 Oak Grove Drive
Pasadena, CA 91109

Slawek Tulaczyk
University of California, Santa Cruz
A208 Earth and Marine Sciences Bldg.
Santa Cruz, CA 95064, United States
831-459-5207 (voice)
831-459-3074 (fax)
tulaczyk@es.ucsc.edu

The Siple Coast ice streams flow over a well lubricated bed. With virtually no surface melt, basal melt is required to sustain a well lubricated bed. We used a recently derived InSAR map of the velocity of Siple Coast ice streams to estimate basal melting/freezing. Melt is determined, in part, by the basal temperature gradient. To obtain this gradient, we modeled ice temperature using the standard advection-diffusion equation for heat transport with the InSAR data used to determine the horizontal advection. Basal melt is also affected by the basal shear stress. We used both force-balance and control-method inversions of the InSAR velocity data to determine basal shear stress.

We find a wide range of melt conditions. Most of the melt occurs beneath the tributaries where larger basal shear stresses and thicker ice favors greater melt (e.g., 10-20 mm/yr). Basal freezing is predicted beneath much of the ice plains of Ice Stream C and Whillans Ice Stream. With a significantly higher basal shear stress, little or no freezing occurs beneath Ice Stream E. These findings are consistent with indications of variable flow over the last millennium in the section of the Ross Ice Shelf fed by Whillans Ice Stream and Ice Streams A and C and with relatively steady flow inferred for the region fed by Ice Streams D and E.